

REMARKS

Upon entry of the present Amendment, claims 1 and 5-22 are all the claims pending in the application. Claims 1 and 5 have been amended. Claims 2-4 have been canceled without prejudice. New claims 20- 22 have been added.

Claim 1 has been amended to recite that the well layer contains a portion having a thickness of 0 nm to 1.5 nm. Support for claim 1 can be found in the specification, for example, at page 13, lines 25-28.

New claim 20 depends from claim 1. Claim 20 recites a gallium nitride compound semiconductor light-emitting device according to claim 1, wherein apertures are formed such that a total surface area of the apertures accounts for 30% to 80% of a surface of the contact layer. Support for claim 20 can be found in the specification, for example, at page 26, lines 24-28.

New claims 21 and 22 depend from claims 1 and 20, respectively. Claims 21 and 22 recite a gallium nitride compound semiconductor light-emitting device according to claim 1 or 20, wherein a minimum horizontal width (lateral width) of a metallic film having the Ohmic electrode is 10 μm or less, and a horizontal width of the aperture is 0.5 μm to 50 μm . Support for claims 21 and 22 can be found in the specification, for example, at page 27, line 1 to page 28, line 2.

No new matter has been added. Entry of the Amendment is respectfully requested.

I. Rejection of claim 5 under 35 U.S.C. 112

Claim 5 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, because claim 5 depends on the canceled claim 4.

In response, claim 5 has been amended to depend from claim 1.

Withdrawal of the rejection is respectfully requested.

II. Rejections under 35 U.S.C. 102(b) and 103(a) Based on Yamada

Claims 1-2, 5, 11 and 16-17 were rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Yamada (US 6,608,330 B1).

Claims 6-8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Hanaoka et al. (US 5,804,839).

Claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada.

Claims 12, 13 and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Morita et al. (US 6,121,636).

Claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Kaneyama et al. (US 6,452,214 B2).

Claims 18 and 19 were rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Sasaoka (US 2003/0042496 A1).

Applicants respectfully traverse the above rejections.

In response to Applicants' arguments that Yamada fails to disclose that the barrier layer is doped with an impurity component, as recited in claim 1, the Examiner asserted that "Yamada discloses a gallium nitride compound semiconductor barrier layer in col. 9, lines 34 - 40, and further discloses in col. 11, lines 7 - 8 that the barrier layers can be made of GaN, InGaN, AlGaN, or the like". The Examiner further asserted that aluminum (Al) is a dopant of the GaN nitride compound. Applicants respectfully disagree.

Doping is a process of introducing impurities into an extremely pure semiconductor in order to change its *electrical properties*. The disclosure of a barrier layer that is made of

AlGaIn in Yamada is not a disclosure of a barrier layer doped with an impurity component, i.e., aluminum.

In addition, claim 1 presently recites that the well layer contains a portion having a thickness of 0 nm to 1.5 nm.

Yamada does not disclose or suggest a gallium nitride compound semiconductor light-emitting device comprising a well layer partially containing a portion having a thickness of 0 nm.

The light emitting device according to claim 1 of the present application is provided with an aperture by removing a part of the electrode so that the emitted light is effectively extracted to the outside. With the aforementioned well layer structure, the device emits light effectively with a lowered forward voltage in spite of the fact that a part of the electrode is removed (*see* the instant specification, page 15, line 25 to page 16, line 8).

In contrast, Yamada discloses that the second well layer has dished portions having a thickness less than a half of an average thickness thereof (Col. 5, line 59 to Col. 6, line 5, and Fig. 6). However, Yamada fails to disclose or teach that the first and second well layers have a portion having a thickness of 0 nm.

Also, the color rendering property of the light-emitting device disclosed in Yamada is adjusted within the range of thickness of the dished portions (Abstract). Therefore, if the second well layer of Yamada has a portion having a thickness of 0 nm to 1.5 nm, Applicants consider that such light-emitting device cannot perform the stated objective or function of Yamada.

Each of Hanaoka, Morita and Kaneyama fails to make up the noted deficiencies of Yamada. None of Hanaoka, Morita and Kaneyama discloses or teaches a gallium nitride compound semiconductor light-emitting device comprising a well layer partially containing a portion having a thickness of 0 nm to 1.5 nm.

Furthermore, the Examiner asserted that Yamada discloses the structure “an Ohmic electrode that is provided on the contact layer and has an aperture through which a portion of the contact layer is exposed”, as recited in claim 1. *See* Office Action, at page 3, third paragraph. Applicants again respectfully disagree.

In Figs. 1, 7 and 9 in Yamada, the horizontal width of the electrode (such as 112) is formed smaller than the horizontal width of the contact layer (such as 111) so that clearances are formed on both sides thereof. However, Yamada describes that the aforementioned electrode mostly covers the contact layer (*see* column 10, lines 42 to 45). In addition, Yamada fails to disclose that, after the electrode is formed, the metal film of the specific portion of the electrode is removed to form a portion through which light permeates.

In contrast, for example, as indicated by reference numeral 17 in Figs. 1, 3, and 4, according to the light-emitting device of claim 1 of the present application, a portion (aperture) through which light permeates is formed by removing a specific portion of the electrode in an arbitrary shape after forming the electrode. By forming the aperture, it becomes possible to adjust the efficiency of extracting light appropriately in accordance with the shape and size of the light-emitting device (*see* page 25, line 11 to page 26, line 3 in the specification of the present application).

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the present §102 and §103 rejections of claims 1 and 5-19.

III. Newly Added Claims

New claims 20-22 depend primarily or secondarily from claim 1. Thus, claims 20-22 are patentable for at least the reasons discussed above with respect to the patentability of independent claim 1.

Claims 20-22 are further patentable over Yamada in viewed of the cited references for the following reasons.

Claim 20 recites that the apertures are formed such that a total surface area of the apertures accounts for 30% to 80% of a surface of the contact layer. According to the electrode formed in the aforementioned light-emitting device, it is possible to sufficiently diffuse the device operation current uniformly and maintain high transmittance with respect to emitted light.

Claims 21 and 22 recite that a minimum horizontal width (lateral width) of a metallic film having the Ohmic electrode is 10 μm or less, and a horizontal width of the aperture is 0.5 μm to 50 μm . According to the aperture formed as mentioned above, it is possible to improve the efficiency of extracting emitted light to the outside.

Yamada does not disclose or suggest that the apertures are formed such that a total surface area of the apertures accounts for 30% to 80% of a surface of the contact layer. In addition, Yamada does not disclose or teach any range of minimum horizontal width (lateral width) of a metallic film having the Ohmic electrode, or any range of the horizontal width of the aperture.

None of Hanaoka, Morita and Kaneyama make up the above-noted deficiencies of Yamada.

IV. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. Withdrawal of all rejections and allowance of claims 1 and 5-22 is respectfully requested. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Yan Lan
Registration No. 50,214

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: October 8, 2008